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PROVISIONAL SPECIFICATION.

Improvements in the Process and Apparatus for Fixing Metallic Tubular Pieces on each other, applicable to Cycle and other Framing or Tubing.

I, PETER JENSEN, of 77 Chancery Lane London Chartered Patent Agent, do hereby declare the nature of this invention, a communication to me from abroad by the Firm of Hoyer & Glahn of Schönebeck on the Elbe, Germany, Manufacturers, to be as follows:—

5 It has heretofore been proposed to join tubular pieces without soldering or brazing and the consequent danger of deteriorating by high heat, by forming grooves in the outside of one piece by means of a contracting tool and after inserting in the other piece forming corresponding grooves in the latter; also by forming the grooves in one piece from within by an expanding tool and after placing it upon the other piece forming corresponding grooves in the latter; by another process the two pieces were
10 placed upon each other, and the grooves then made in both by one operation, and either from within by an expanding tool or from without by a contracting tool. It has also been proposed to form grooves in one of the pieces and after assembling the two pieces forming corresponding grooves in the other piece by means of liquid or
15 hydraulic pressure acting within the inner piece.

The aforesaid processes suffer more or less from the defect that the joints so made after a time, when used in a cycle frame or otherwise where they are exposed to continual racking motions become more or less loose or shaky.

Our process which is applicable to all the aforesaid processes consists firstly in
20 coating the pieces to be joined with tin or other thin fluid metal or alloy previously to the formation of grooves or indents in the one or in both the pieces or previously to assembling them; and secondly in heating the outer piece, by gas jets or otherwise so as to expand it to a suitable regulated degree, it being understood that the inner piece is of such a size as to require to be driven in by a light blow or pressure into
25 the heated outer piece. When the pieces the outer piece being hot have been indented in one of the modes described and have cooled down they fit permanently tight on each other, the tin forming the required soft medium between them to ensure accurately fitting surfaces in contact and the filling in of any minute cavities between them.

30 Another improvement which is applicable to all expanding tools for making grooves, annular, helical or otherwise, or indents of any suitable form, in the tubular pieces to be united, consists in providing an oil chamber in the mandril tool; said chamber being closed by a screw plug and provided with small holes for the issue of the oil to the acting parts of the tool. By this means the grooves or indents can be made more
35 uniformly smooth, all danger of fretting or roughening of the surfaces in contact is avoided, and the process can be performed more easily.

In mandril tools for forming cup shaped or other indents the mandril is enclosed in a tube to the forward end of which are hinged three or more ears with projections of the cup or other desired form for indenting. The mandril at its forward end is made

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Jensen's Improvements in Fixing Metallic Tubular Pieces one upon the other.

conical, so that when brought forward in its tube by screw means or otherwise, the conical end acts upon the hinged ends and presses them against the surface of the tubular piece to be indented. Behind the cone is provided an annular end or shoulder and the tube has at its forward end small holes which allow the issue of oil for the acting parts of the hinged ends when the mandril is brought forward far and upon the said ends.

Another part of the invention consists in improved forms of joints for uniting tubular pieces. The end of one piece is conically enlarged, or chamfered. The smaller end of the chamber being at the outer end of the said piece. This may be done for instance by casting, or in case of steel, iron or other expandable material by means of a mandril working in a cone ring in three pieces. This tube piece and the other tube piece which is to be pushed into and joined thereto are inserted and the outer chamfered tube piece being located the pieces are pushed into each other and the inner one expanded so as to fill the chamfered part of the outer. The joint may be further strengthened by forming grooves or apertures on the way of the ends described. A somewhat similar construction is applicable to the junction of the steering handle pillar with bearing cup or ferrule and the steering socket. The upper end of the said socket is conically expanded by driving into it a ferrule made conical in its upper part and having the cup for the handle. This expanding tool for ball bearing and for junction piece. This socket is by this means expanded so as to fill a conical recess formed into the tubular collar piece into which the upper member of the frame is to be fixed. This fixing is effected in a similar manner that is to say the end of the other piece is inserted into it a conical recess into which the upper member of the frame is expanded by driving into it a ferrule inserted through a hole in the other piece and which is conical outside to suit the said conical recess. The parts are fitted and the other part heated as aforesaid, and indents may also be formed for further security.

In a similar manner the three members of the tubular frame are united to the tubular socket piece carrying the fork and the bearing for the front wheel. The end of the tubular piece which is to be expanded by means of the conical ferrule may be cut up into lips or tongues.

Dated this Fourth day of December 1896.

JENSEN & SON,
77, Chancery Lane, London, W.C., Patent Agents.

COMPLETE SPECIFICATION

Improvements in the Process and Apparatus for Fixing Metallic Tubular Pieces one upon the other, applicable to Cycle and other Framing or Tubing.

I, **PERER JENSEN** of 77, Chancery Lane, London, Chartered Patent Agent, do hereby declare the nature of this invention, a communication to me from abroad by the Firm of **Meyer & Glinz** of Schenbeck in the Elbe, Germany, Manufacturers, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

It has heretofore been proposed to join tubular pieces without soldering or brazing and in order to avoid the consequent danger of deteriorating the quality of the metal by high heat, by forming grooves in the outside of one piece by means of a contracting tool and after inserting such piece in the other piece forming corresponding grooves in the latter; also by forming the grooves in the one piece from within by an expanding tool and after placing such piece upon the other piece forming

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Jensen's Improvements in Firing Metallic Tubular Pieces on each other.

responding grooves in the latter. By another process described in my Patent specification No. 22807 of 1895 the two pieces were placed upon each other, and the grooves then made in both by one operation, and either from within by an expanding tool or from without by a contracting tool. It has also been proposed to form grooves in one of the pieces, and after assembling the two pieces forming corresponding grooves in the other piece by means of liquid or hydraulic pressure acting within the inner piece.

The aforesaid processes suffer in one or less from the defect that the joints so made after a time, when used in a cycle frame or otherwise where they are exposed to continual racking motions become more or less loose or shaky. The reason is chiefly this that the grooved parts though fitting closely in each other when the expanding or contracting force is being applied, recede and thus unequally, by the elasticity of the tube material, when the force ceases, and minute interstices thus formed, or in other words the fit is not absolutely tight.

This present process which is applicable to all the aforesaid and similar processes consists firstly in coating the tubular pieces to be joined with tin or other thin fluid metal or alloy previously to the formation of grooves or indents in the one or in both pieces or previously to or during the assembling of them or afterwards; and secondly in heating the outer tubular piece, by gas jets or otherwise, so as to expand to a suitable regulated degree, it being understood that the inner tubular piece is such a size or diameter as to require to be driven in by a light blow or pressure to the heated outer piece. When the pieces, the inner piece being hot, have been indented in one of the modes hereinbefore described and have cooled down they fit permanently tight on each other, the tin forming the required soft medium between them to ensure accurately fitting surfaces in contact and the filling of any minute voids between them.

Another improvement which is applicable to all expanding tools for making grooves, annular, helical, or otherwise, or indents of any suitable form in the tubular pieces to be united consists in providing an oil chamber in the mandril tool, said chamber being closed by a screw plug and provided with small holes for the issue of the oil to the acting parts of the tool. By this means the grooves or indents can be made more uniformly smooth, all danger of fretting or roughening of the surfaces in contact is avoided and the process can be performed more easily.

Fig. 1 shows as an example a conical mandril A with raised helical ribs A' and forming a central oil chamber which is closed by means of a screw plug B. The oil flows out through the small holes C.

In mandril tools for forming cup shaped or other indents the mandril A shown in longitudinal section Fig. 2 is according to this invention enclosed in a tube D to the forward end of which are hinged three or more cams E with projections F of cup shape (or other desired form) for indenting. The mandril at its forward end A' is also conical, so that when brought forward in its tube D by screw motion or otherwise the cone end A' acts upon the hinged cams, which may each have a roller E'; and presses them against the inside of the tubular piece to be indented. Behind the cone A' is provided an annular oil chamber F, and the tube D has at its forward end small holes G which allow the issue of oil to the acting parts E' of the hinged cams when the mandril is brought forward to act upon the said cams or their rollers.

Another part of this invention consists in improved forms of joints for uniting tubular pieces.

As shewn in the longitudinal section Fig. 3, the end of one piece G is conically tapered or chambered, the small end of the chamber being at the outer end of the piece. This may be done for instance by casting, or in case of mild steel, iron, or other expandible metal or alloy, by means of a mandril working in a cone ring in two pieces. This tube piece G and the other tube piece H which is to be pushed on and joined thereto are turned, and the outer chambered tube piece G being fixed, the pieces G and H are pushed into each other and the inner one H expanded

Jensen's Improvements in Filing Metallic Tubular Pieces on each other.

as shewn at H' so as to fill the chambered part of the other. Or the tinning may be done during or after the assembling of the parts.

Fig. 4 shews a joint of this kind which is further strengthened by forming grooves or indents in any of the modes described.

Fig. 5 shews a joint of the kind where the part I is a casting which is fixed to the tube piece G by forming an annular groove G' or it may be two such in the piece G corresponding to the groove in the piece I, this latter being driven on hot before the ends of the tube pieces G and H are expanded to conform to the inner shape of the socket piece I, the parts I, H and G should be tinned before during or after being put together. The groove in the socket I is by preference turned in on a lathe.

Fig. 6 shews another form of cast socket piece I for uniting two tube pieces G and H, and Fig. 7 yet another form where the uniting socket I is made conical toward both ends.

A somewhat similar construction is shewn in Fig. 8 as applicable to the junction of the ball bearing cup or ferrule K of the steering handle pillar with the steering pillar socket L, the ferrule K thus serving both for ball bearing and for junction piece. The socket L is by this means expanded so as to fill a conical recess turned into the tubular elbow piece M into which the upper member N of the frame is to be fixed. This fixing is effected in a similar manner, that is to say the end of the elbow piece M has turned into it a conical recess into which the said upper member N is expanded by driving into it a ferrule O inserted through a hole M in the elbow piece and which is conical outside to suit the said conical recess. The parts are tinned and the outer part heated as aforesaid, and indents may also (as described with reference to Fig. 4) be formed for further security.

In a similar manner as shewn in Fig. 9 the three members P, Q and R of the tubular frame are united by a three armed socket piece O and the member R may be united at its upper end in a similar manner to the tubular socket piece carrying the fork for the front wheel.

The end of the tubular piece which is to be expanded by means of the cone ferrule may as shewn in Fig. 10 be cut up into lips or tongues.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed I declare that what I claim is—

1. In processes for uniting tubular pieces by forming grooves or other indents; the coating of the said pieces, and of the uniting sockets when used, in such processes, with tin or other thin fluid metal or alloy previously to, while or after assembling such parts and the heating of the outer piece or part so as to expand it to such a degree that the inner piece has to be driven into the outer heated piece by a light blow or pressure, for the purpose that after the grooving or indenting and tinning have been effected, the outer part shall be found to be firmly shrunk upon the inner piece, the tin serving to fill any minute cavities, between them, substantially as set forth.

2. In tools for making grooves or other indents in tubular pieces for uniting them the application and use of an oil chamber with filling plug and with small outlet holes for lubricating the acting parts of the tool substantially as set forth.

3. In mandril tools for forming cup shaped or other indents the combination of the mandril with conical front end, an outer tube D to which one or more indenting cams are hinged to be actuated by the said conical front end, an oil chamber such as F and oil outlet holes in the tube substantially as described with reference to Fig. 2.

4. The forms of joint for tubular pieces substantially as described with reference to Figs. 3 to 10 and in connection with the process firstly claimed.

Dated this Third day of June 1897.

JENSEN & SON,

77 Chancery Lane, London, W.C., Patent Agents.